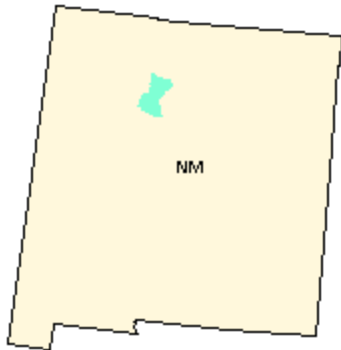


TOTAL MAXIMUM DAILY LOAD FOR TOTAL PHOSPHORUS FOR REDONDO CREEK



Summary Table

New Mexico Standards Segment	Rio Grande 2106
Waterbody Identifier	Redondo Creek from the mouth on Sulphur Creek to the headwaters (MRG2-40100) 5.2 miles.
Parameters of Concern	Total Phosphorus
Uses Affected	High Quality Coldwater Fishery
Geographic Location	Rio Grande Basin (Jemez)
Scope/size of Watershed	12 mi ² (Redondo Creek)
Land Type	Ecoregions: Southern Rockies (210, 211) Arizona-New Mexico Plateau (220, 221)
Land Use/Cover	Forest (96%), Rangeland (1%), Urban (3%)
Identified Sources	Natural and Unknown
Watershed Ownership	Forest Service (7%), Private (93%)
Priority Ranking	4
Threatened and Endangered Species	None
TMDL for: Total Phosphorus (as mg/L)	WLA(0) + LA(0.324) + MOS(0.108)= .432 lbs./day

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EXECUTIVE SUMMARY

Section 303(d) of the Federal Clean Water Act requires states to develop TMDL management plans for water bodies determined to be water quality limited. A TMDL documents the amount of a pollutant a water body can assimilate without violating a state's water quality standards. The TMDL also allocates that load capacity to known point sources and nonpoint sources at a given flow. TMDLs are defined in 40 CFR Part 130 as the sum of the individual Waste Load Allocations (WLA) for point sources and Load Allocations (LA) for nonpoint sources, including a margin of safety and natural background conditions.

The Jemez River Basin is a sub-basin of the Rio Grande Basin, located in northcentral New Mexico. Headwater tributaries to the Jemez River include Redondo Creek from the mouth on Sulphur Creek to its headwaters. The US Geological Survey and the Surface Water Quality Bureau have water quality stations located on Redondo Creek at the USDA FS-Baca Boundary (private land) and above the confluence with Sulphur Creek. This monitoring effort documented several exceedances of New Mexico water quality standards for total phosphorus. This Total Maximum Daily Load (TMDL) document addresses this constituent for Redondo Creek.

A general implementation plan for activities to be established in the watershed is included in this document. The Surface Water Quality Bureau's Nonpoint Source Pollution Section will further develop the details of this plan. Implementation of recommendations in this document will be done with full participation of all interested and affected parties. During implementation, additional water quality data will be generated. As a result, targets will be re-examined and potentially revised; this document is considered to be an evolving management plan. In the event that new data indicate that the targets used in this analysis are not appropriate or if new standards are adopted, the load capacity will be adjusted accordingly. When water quality standards have been achieved, the reach will be removed from the TMDL list.

List of Abbreviations

BMP	Best Management Practice
CFR	Code of Federal Regulations
CFS	Cubic Feet per Second
CWA	Clean Water Act
CWAP	Clean Water Action Plan
EPA	Environmental Protection Agency
FS	The US Department of Agriculture Forest Service
HQCWF	High Quality Coldwater Fishery
LA	Load Allocation
MGD	Million Gallons per Day
mg/L	Milligrams per Liter
MOS	Margin of Safety
MOU	Memorandum of Understanding
NMED	New Mexico Environment Department
NPDES	National Pollutant Discharge Elimination System
NPS	Nonpoint Sources
SWQB	Surface Water Quality Bureau
TMDL	Total Maximum Daily Load
TP	Total Phosphorus
TSS	Total Suspended Solids
UWA	Unified Watershed Assessment
USGS	The US Geological Survey
WLA	Waste Load Allocation
WQLS	Water Quality Limited Segment
WQCC	New Mexico Water Quality Control Commission
WQS	Water Quality Standards (20 NMAC 6.1)

Background Information

The Jemez River Basin is a sub-basin of the Rio Grande Basin, located in northcentral New Mexico. This 1043 mi² watershed is dominated by both forest and rangeland (Figure 1) on Forest Service, Tribal, and private land. Formed by a large volcanic complex, the Jemez mountains are a geothermal reservoir created by cooling magma. Headwater tributaries to the Jemez River include Redondo Creek which originates on the Baca Land Grant, location #1 (SWQB/NMED 1987). Redondo Creek drains a small basin in the Valles Caldera, a region of tertiary and quaternary volcanic origin. Its watershed drainage area is 12 mi² located primarily on private and Forest Service land.

The Redondo Creek stream reach is from the mouth on Sulphur Creek to the headwaters. Data collected at surface water quality monitoring stations were used to characterize the water quality of this stream reach (Figure 2). This monitoring effort documented several exceedances of New Mexico water quality standards for total phosphorus. This TMDL is for total phosphorus on Redondo Creek from the confluence with Sulphur Creek to its headwaters.

Endpoint Identification

Target Loading Capacity

Target values for total phosphorus will be determined based on 1) the presence of numeric criteria, 2) the degree of experience in applying the indicator and 3) the ability to easily monitor and produce quantifiable and reproducible results.

The Jemez River and all its tributaries (including Redondo Creek) above State highway 4 near the town of Jemez springs and the Guadalupe River and its tributaries make up waterbody segment 2106. The designated uses for this reach are domestic water supply, fish culture, high quality coldwater fishery, irrigation, livestock watering, wildlife habitat, and secondary contact. The standards are as follows:

1. In any single sample: conductivity shall not exceed 400 umhos, pH shall be within the range of 6.6 to 8.8, temperature shall not exceed 20 C (68F), and turbidity shall not exceed 25 NTU. The use-specific numeric standards set forth in Section 3101 are applicable to the designated uses listed above in Section 2106.
2. The monthly geometric mean of fecal coliform bacteria shall not exceed 100/100 ml; no single sample shall exceed 200/100 ml (see Section 1103B) (NMWQCC 1995).

In addition, The State of New Mexico water quality standards (see Section 3101.C) (NMWQCC 1995) establish for all streams classified as a high quality coldwater fishery, a numeric criterion for total phosphorus of 0.1 mg/L.

Total Phosphorus

The chemistry of phosphorus is such that most of the phosphorus entering into aquatic systems will be either sorbed onto soil particles or incorporated into organic compounds. Any unbound phosphate ions that enter into streams are readily taken up by aquatic plants and microorganisms. The rapid biological uptake and ease of chemical bonding explain why phosphate concentrations in natural waters are very

low (EPA 1991). Thus, soil erosion can be a primary source of phosphorus entering a waterbody (EPA 1991). A moderate correlation exists between turbidity and TSS using a linear regression of the Redondo Creek data ($R^2=0.677$)(Appendix A). However, soil erosion does not appear to be the source of total phosphorus in this watershed; no correlation ($R^2=-0.063$) was documented between TSS and total phosphorus for Redondo Creek (Appendix B). As well, there was a weak correlation ($R^2=0.208$) between turbidity and total phosphorus (Appendix C). Therefore, total phosphorus concentrations in the stream can not be linked to sediment loading. The observed water quality standard exceedances for total phosphorus must be from other sources in the watershed.

Figure 1

Figure 2

Flow

This TMDL is calculated for Redondo Creek at a specific flow. When available, US Geological Survey gages are used to estimate flow. Where gages are absent, geomorphologic cross sectional information is taken at each site and the flows are modeled. Water quality samples for total phosphorus were taken at the cross section. The cross section and water quality sampling stations were located near the confluence with Sulphur Creek (Figure 2). It is important to remember that the TMDL is a planning tool to be used to achieve water quality standards. Since flows vary throughout the year in these systems, the target load will vary based on the changing flow. Management of the load should set a goal at water quality standards attainment; not meeting the calculated target load.

Calculations

Gaged streamflow data is not available for Redondo Creek. Exceedances of water quality standards for total phosphorus were documented by the SWQB during spring and summer periods, mainly during low flow events. Therefore, high flow events (i.e. bankfull stage) will not be incorporated into this TMDL. The primary source of phosphorus to this system is attributed to nonpoint sources. Under these conditions, NMED procedures call for the calculation of stream discharge from Equation 1 (USGS 1982), and the channel cross-section analyzer WinXSPRO® (FS 1998).

Following USGS (1982), average discharge is calculated using the regression equation in *Equation 1*.

$$Q_A = 64 W_{ac}^{1.88}$$

Q_A =acre-feet/year, W_{ac} =width of the active channel (width at bankfull) (Appendix E).

Utilizing the Redondo Creek cross section in Appendix F, the width of Redondo Creek at bankfull is 3.05ft. Applying Equation 1 yields a calculated volume or flow of 520.79 acre/feet year or .718 cfs (Appendix D).

$$Q_A = 64(3.05)^{1.88}$$

$$Q_A = 64 \times 8.136$$

$$Q_A = 520 \text{ acre feet/year}$$

$$= 1.426 \text{ acre feet day}$$

$$= 1.426/2.00 \text{ acres}$$

$$= .718 \text{ cfs} (+/- .20) \text{ (standard error } +/- 28\%)$$

With a standard error of +/-28%, the estimated average discharge ranges from 0.518-0.918 cfs.

This calculation overlaps with the low end of the WinXSPRO® model calculated @ 1/3 bankfull depth (0.5ft) for an estimate of average daily flow according to Leopold et al. (1994, 1964)(Appendix D).

Target and measured loads will for total phosphorus expressed in lbs./day will be calculated from the lower end of the standard error of the estimated mean average discharge for Redondo Creek 0.518 cfs (Appendix D).

Average discharge is defined as that flow rate which if continued every day of the year, would yield the observed annual volume of water. The average discharge usually fills a channel to approximately one-

third of the channel depth, and this flow rate is equaled or exceeded approximately 25% of the days in a year (Leopold et al. 1964). Average discharge is characterized by four attributes, which make it ideal for TMDL modeling:

1. Approximately 75% of the time, flows are less than the average discharge.
2. Volume carried by these flows amounts to only 25% of the annual volume.
3. It can be easily modeled.
4. It's the discharge average for 365 days (one year).

The target load or (TMDL) for total phosphorus was calculated using the lower range of the standard error of the estimated mean for average discharge for Redondo Creek (0.518 cfs) as the critical flow and the current standard for total phosphorus (0.1 mg/L). This target load will determine the maximum loading per day into Redondo Creek that will not result in an exceedance of the total phosphorus standard. This target load was calculated using Equation 2 and is in Table 1: Calculation of Load Allocation.

Equation 2. critical flow (mgd) x standard (mg/L) x 8.34 (conversion factor) = target loading capacity

Table 1: Calculation of Target Loads

Location	Flow + (mgd)	Standards	Conversion Factor *	Target Load Capacity (lbs./day)
Redondo Creek	0.518	0.10 mg/L	8.34	0.432 (lbs./day)

+Flow is estimated at the low end of the standard error of mean average discharge using USGS (1982) and FS (1998).

*see Appendix G Conversion Factor Derivation

The measured loads were calculated using Equation 2. In order to achieve comparability between the target and measured loads, the flows used were the same for both calculations for critical flow. The geometric mean of the data that exceeded the standards from the data collected at each site was substituted for the standard in Equation 1. The same conversion factor of 8.34 was used. Results are presented in Table 2.

Background loads were not possible to calculate in this watershed. A reference reach, having similar stream morphology and flow, was not found. It is assumed that a portion of the load allocation is made up of natural background loads. In future water quality surveys, finding a suitable reference reach will be a priority.

Table 2: Calculation of Measured Loads

Location	Flow + (mgd)	Geometric Mean* (mg/L)	Conversion Factor	Measured Load
Redondo Creek	0.518	0.274	8.34	1.18 (lbs./day)

+Flow is estimated at the low end of the standard error of mean average discharge using USGS (1982) and FS (1998).

*geometric mean is calculated from the number (n=3) of total phosphorus exceedances collected by SWQB in 1998.

Waste Load Allocations and Load Allocations

•*Waste Load Allocation*

There are no point source contributions associated with this TMDL. The waste load allocation is zero.

•*Load Allocation*

In order to calculate the Load Allocation (LA), the waste load allocation and margin of safety were subtracted from the target capacity (TMDL) following Equation 3.

$$\text{Equation 3. } WLA + LA + MOS = TMDL$$

Results are in Table 3: Calculation of TMDLs for total phosphorus.

Table 3: Calculation of TMDL for Total Phosphorus

Location	WLA (lbs./day)	LA (lbs./day)	MOS (25%) (lbs./day)	TMDL (lbs./day)
Redondo Creek	0	0.324	0.108	0.432

The load reductions that would be necessary to meet the target loads were calculated to be the difference between the target load (Table 1) and the measured load (Table 2). Results follow in Table 4: Calculation of Load Reductions.

Table 4: Calculation of Load Reductions for Total Phosphorus (lbs./day)

Location	Target Load	Measured Load	Load Reductions
Redondo Creek	0.32	1.18	0.86

Identification and Description of pollutant source(s)

Table 5: Pollutant Source Summary

Pollutant Sources	Magnitude Load Allocation	Location	Potential Sources (% from each)
<u>Point</u> : None	0	-----	0%
<u>Nonpoint</u> : <ul style="list-style-type: none">• Total Phosphorus (in lbs./day)	0.32		100% Natural Unknown

Linkage of Water Quality and Pollutant Sources

Where available data are incomplete or where the level of uncertainty in the characterization of sources is large, the recommended approach to TMDLs requires the development of allocations based on estimates utilizing the best available information.

SWQB fieldwork includes an assessment of the potential sources of impairment (SWQB/NMED 1999a). The Pollutant Source(s) Documentation Protocol, shown as Appendix H, provides an analysis for a visual evaluation of the source along an impaired reach. Although this procedure is subjective, SWQB feels that it provides the best available information for the identification of potential sources of impairment in this watershed. Table 5 (Pollutant Source Summary) identifies and quantifies potential sources of point and nonpoint source impairments along each reach as determined by field reconnaissance and assessment. A further explanation of the sources follows.

Redondo Creek

According to *Soils of New Mexico* (1978), soils in the Redondo Creek watershed are dominantly neutral to slightly acidic and are well drained and productive, supporting good stands of native vegetation. This report states that for the Redondo Creek watershed, soils have a very high organic content and are affected by fluctuating water tables. High organic matter content can characterize some soils in the Eutroboralfs-Haploborolls association found in this watershed. Therefore, natural sources of phosphorus in the soil are most likely contributing to the phosphorus concentration in the stream.

Elk and other wildlife are found throughout the watershed. These animals can represent a potentially important source of phosphate contributions. Animal waste can directly impair water quality through bacterial contamination and increasing nutrient levels.

The majority of the watershed (approximately 93%) drains private land. Domestic livestock grazing occurs throughout the watershed, which may contribute to phosphate loading.

Margin of Safety (MOS)

TMDLs should reflect a margin of safety based on the uncertainty or variability in the data, the point and nonpoint source load estimates, and the modeling analysis. For this TMDL, there will be no margin of safety for point sources, since there are none. However, for the nonpoint sources the margin of safety is estimated to be an addition of **25%** of the TMDL. This margin of safety incorporates several factors:

- Errors in calculating NPS loads*

A level of uncertainty exists in the relationship between background total phosphorus loading from natural and unknown sources. Soils in the Redondo Creek watershed have a high organic content and may be contributing to the total phosphorus concentrations in the stream. As well, a majority of the watershed is located on private land. The contribution of total phosphorus loading from domestic livestock grazing and other activities on private land is not clear. There is also a potential to have errors in measurements of nonpoint source loads due to equipment accuracy, time of sampling etc. Accordingly, a conservative margin of safety increases the TMDL by **25%**.

- Errors in calculating flow*

Flow estimates were based on estimated mean average discharge using USGS 1982, and cross sectional information utilizing WinXSPRO®. During low flow conditions; documented total phosphorus exceedances occurred, critical flow is a conservative condition set during low flow (average discharge) periods. The standard error of estimated mean average discharge is 28%. Conservative values were used to calculate loads and do not warrant additional MOS.

Consideration of seasonal variation

Data used in the calculation of this TMDL were collected during spring, summer, and fall in order to ensure coverage of any potential seasonal variation in the system. Exceedances of water quality standards for total phosphorus were documented by the SWQB during spring and summer periods, mainly during low flow events. Since the critical condition is set to estimated mean average discharge, all data were used in determining the target capacities. Therefore, it can be assumed that if the critical condition is being met, coverage of any potential seasonal variation will also be met.

Monitoring Plan

Pursuant to Section 106(e)(1) of the Federal Clean Water Act, the SWQB has established appropriate monitoring methods, systems and procedures in order to compile and analyze data on the quality of the surface waters of New Mexico. In accordance with the New Mexico Water Quality Act, the SWQB has developed and implemented a comprehensive water quality monitoring strategy for the surface waters of the State. The monitoring strategy establishes the methods of identifying and prioritizing water quality data needs, specifies procedures for acquiring and managing water quality data, and describes how these data are used to progress toward three basic monitoring objectives: to develop water

quality-based controls, to evaluate the effectiveness of such controls, and to conduct water quality assessments.

The SWQB utilizes a rotating basin system approach to water quality monitoring. In this system, a select number of watersheds are intensively monitored each year with an established return frequency of every five years.

The SWQB maintains current quality assurance and quality control plans to cover all monitoring activities. This document “Quality Assurance Project Plan for Water Quality Management Programs” (QAPP) is updated annually.

Current priorities for monitoring in the SWQB are driven by the 303(d) list of streams requiring TMDLs. Short-term efforts will be directed toward those waters which are on the EPA TMDL consent decree list (Forest Guardians and Southwest Environmental Center v. Carol Browner, Administrator, US EPA, Civil Action 96-0826 LH/LFG, 1997) and which are due within the first two years of the monitoring schedule. Once assessment monitoring is completed those reaches still showing impacts and requiring a TMDL will be targeted for more intensive monitoring. The methods of data acquisition include fixed-station monitoring, intensive surveys of priority water bodies, including biological assessments, and compliance monitoring of industrial, federal and municipal dischargers. These methods are specified in the Assessment Protocol (SWQB/NMED 1998a).

Long term monitoring for assessments will be accomplished through the establishment of sampling sites that are representative of the waterbody and which can be revisited every five years. This gives an unbiased assessment of the waterbody and establishes a long term monitoring record for simple trend analyses. This information will provide time relevant information for use in 305(b) assessments and to support the need for developing TMDLs.

This approach provides:

- o a systematic, detailed review of water quality data which allows for a more efficient use of monitoring resources.
- o information at a scale where implementation of corrective activities is feasible.
- o an established order of rotation and predictable sampling in each basin, which allows for enhanced coordinated efforts with other programs.
- o program efficiency and improves the basis for management decisions.

It should be noted that a basin will not be ignored during its four year sampling hiatus. The rotating basin program will be supplemented with other data collection efforts which will be classified as field studies. This time will be used to analyze the data collected, conduct field studies to further characterize identified problems, and develop and implement TMDLs. Both types of monitoring, long term and field studies, can contribute to the §305(b) and §303(d) listing processes, but they should be stored in the primary database with distinguishing codes which will allow separate data retrievals.

The following schedule is a draft for the sampling seasons through 2002 and will be followed in a consistent manner to support the New Mexico Unified Watershed Assessment (UWA) and the Nonpoint Source Management Program. This sampling regime will reflect seasonal variation and include sampling in spring, summer, and fall for each of the watersheds.

1998 - Jemez, Chama (above El Vado), Cimarron (above Springer), Santa Fe, San Francisco

1999 - Chama (below El Vado), middle Rio Grande, Gila, Red River

2000 - Mimbres, Dry Cimarron, upper Pecos (headwaters to Ft. Sumner), upper Rio Grande (part1)

2001 - Upper Rio Grande (part 2), lower Pecos (Roswell south), Closed Basins, Zuni

2002 - Canadian Basin, lower Rio Grande, San Juan, Rio Puerco

Implementation plan

Management Measures

Management measures are “economically achievable measures for the control of the addition of pollutants from existing and new categories and classes of nonpoint sources of pollution, which reflect the greatest degree of pollutant reduction achievable through the application of the best available nonpoint pollution control practices, technologies, processes, siting criteria, operating methods, or other alternatives” (USEPA 1993). A combination of best management practices (BMPs) will be used to implement this TMDL. BMPs in this area will *include riparian restoration where needed. Good range management will be encouraged along the entire reach. SWQB will work with private land owners and the FS to encourage the implementation of BMPs such as: riparian restoration, streambank stabilization, and good range management where needed.*

Presently, the FS is addressing several sources of NPS pollution that originate on properties managed by the FS in the Jemez watershed. Such activities and proposals include: timber thinning and prescribed fire to prevent catastrophic wildfires and to improve groundcover and watershed conditions, improved grazing management, road closures, relocation of roads out of riparian areas to exclude livestock and vehicles. The SWQB will continue coordination with the FS in implementing BMPs in this watershed.

Public outreach and stakeholder involvement in the implementation of this TMDL will be ongoing. Stakeholder participation will include choosing and installing BMPs, as well as potential volunteer monitoring. Stakeholders in this process will include: SWQB, FS, local government, private land owners, tribes, environmental groups, and the general public.

Time Line

Implementation Actions	Year 1	Year 2	Year 3	Year 4	Year 5
Public Outreach and Involvement	X	X	X	X	X
Establish Milestones	X				
Secure Funding	X		X		
Implement Management Measures (BMPs)		X	X		
Monitor BMPs		X	X	X	
Determine BMP Effectiveness				X	X
Re-evaluate Milestones				X	X

Assurances

New Mexico's Water Quality Act does not contain enforceable prohibitions directly applicable to nonpoint sources of pollution. The Act does authorize the Water Quality Control Commission to "promulgate and publish regulations to prevent or abate water pollution in the state" and to require permits. Several statutory provisions on nuisance law could also be applied to nonpoint source water pollution.

NMED nonpoint source water quality improvement work utilizes a voluntary approach. This provides technical support and grant money for the implementation of best management practices and other NPS prevention mechanisms through §319 of the Clean Water Act. Since this TMDL will be implemented through NPS control mechanisms the New Mexico Nonpoint Source Program is targeting efforts to this watersheds. The Nonpoint Source Program coordinates with the Nonpoint Source Taskforce. The Nonpoint Source Taskforce is the New Mexico statewide focus group representing federal and state agencies, local governments, tribes and pueblos, soil and water conservation districts, environmental organizations, industry, and the public. This group meets on a quarterly basis to provide input on the Section 319 program process, to disseminate information to other stakeholders and the public regarding nonpoint source issues, to identify complementary programs and sources of funding, and to help review and rank Section 319 proposals.

In order to ensure reasonable assurances for implementation in watersheds with multiple landowners, including Federal, State and private, NMED has established MOUs with several Federal agencies, in particular the Forest Service and the Bureau of Land Management. These MOUs provide for coordination and consistency in dealing with nonpoint source issues.

New Mexico's Clean Water Action Plan has been developed in a coordinated manner with the State's 303(d) process. All Category I watersheds identified in New Mexico's Unified Watershed Assessment process are totally coincident with the impaired waters list for 1996 and 1998 approved by EPA. The State has given a high priority for funding assessment and restoration activities to these watersheds. The time required to attain standards for all reaches is estimated to be approximately 10-20 years. This is based on a five-year time frame implementing several watershed projects that may not be starting immediately or may be in response to earlier projects. The cooperation of private landowners and Federal Agencies will be pivotal in the implementation of this TMDL.

Milestones

Milestones will be used for determining if control actions are being implemented and standards attained. For this TMDL several milestones will be established such as a reduction in total phosphorus concentrations within a certain time frame. These milestones will vary based on the BMPs implemented at each site. Another milestone will be to update or develop MOUs with other state and federal agencies by 2001 to ensure protection and restoration in this watershed, and to increase education and outreach activities regarding total phosphorus concentrations in this watershed, particularly for private landowners.

Milestones will be reevaluated periodically, depending on what BMP was implemented. Further implementation of this TMDL will be revised based on this reevaluation. The process will involve: monitoring pollutant loading, tracking implementation and effectiveness of controls, assessing water quality trends in the waterbody, and reevaluating the TMDL for attainment of water quality standards.

Public Participation

Public participation was solicited in development of this TMDL. See Appendix I for flow chart of the public participation process. The draft TMDL was made available for a 30-day comment period starting (*August 10, 1999*). Response to comments is attached as Appendix J of this document. The draft document notice of availability was extensively advertised via newsletters, email distribution lists, webpage postings (<http://www.nmenv.state.nm.us>), and press releases to area newspapers.

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Appendices

Appendix A: Relationship between Turbidity and Total Suspended Solids for Redondo Creek.

Appendix B: Relationship between Total Suspended Solids and Total Phosphorus for Redondo Creek.

Appendix C: : Relationship between Turbidity and Total Phosphorus for Redondo Creek.

Appendix D: Estimated Average Discharge for Redondo Creek.

Appendix E: Equation for Determining Mean Annual Runoff for Streams in the Western U.S.

Appendix F: Redondo Creek Cross Section.

Appendix G: Conversion Factor Determination.

Appendix H. Pollutant Source(s) Documentation Protocol.

Appendix I: Flow Chart of the Public Participation Process

Appendix J: Response to Comments

Appendix A: Relationship between Turbidity and Total Suspended Solids for Redondo Creek

Appendix B: Relationship between Total Suspended Solids and Total Phosphorus for Redondo Creek

Appendix C: Relationship between Turbidity and Total Phosphorus for Redondo Creek

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Appendix F: Redondo Creek Cross Section

Appendix G: Conversion Factor Determination

8.34 Conversion Factor Derivation

Million gallons/day x Milligrams/liter x 8.34 = pounds/day

10^6 gallons/day x 3.7854 liters/1-gallon x 10^{-3} gram/liter x 1 pound/454 grams = pounds/day

$10^6 (10^{-3}) (3.7854)/454 = 3785.4/454$

= 8.3379

= **8.34**

Appendix H: POLLUTANT SOURCE(S) DOCUMENTATION PROTOCOL

This protocol was designed to support federal regulations and guidance requiring states to document and include probable source(s) of pollutant(s) in their §303(d) Lists as well as the States §305(b) Report to Congress.

The following procedure should be used when sampling crews are in the field conducting water quality surveys or at any other time field staff are collecting data.

Pollutant Source Documentation Steps:

- 1). Obtain a copy of the most current §303(d) List.
- 2). Obtain copies of the *Field Sheet for Assessing Designated Uses and Nonpoint Sources of Pollution*.
- 3). Obtain 35mm camera that has time/date photo stamp on it. **DO NOT USE A DIGITAL CAMERA FOR THIS PHOTODOCUMENTATION**
- 4). Identify the reach(s) and probable source(s) of pollutant in the §303(d) List associated with the project that you will be working on.
- 5). Verify if current source(s) listed in the §303(d) List are accurate.
- 6). Check the appropriate box(s) on the field sheet for source(s) of nonsupport and estimate percent contribution of each source.
- 7). Photodocument probable source(s) of pollutant.
- 8). Create a folder for the TMDL files, insert field sheet and photodocumentation into the file.

This information will be used to update §303(d) Lists and the States §305(b) Report to Congress.

Appendix I: Flow Chart of the Public Participation Process

Appendix J: Response to Comments

To be completed.